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OFFICE OF THE DEPUTY PRINCIPAL
ACADEMICS, STUDENT AFFAIRS AND RESEARCH

UNIVERSITY EXAMINATIONS

2018 /2019 ACADEMIC YEAR

SECOND YEAR SECOND SEMESTER REGULAR EXAMINATION

FOR THE DEGREE OF BACHELOR OF SCIENCE (APPLIED STATISCTICS WITH COMPUTING)

COURSE CODE: STA 217

COURSE TITLE: PRINCIPLES OF STATISTICAL INFERENCE

DATE: 16/4/2019 **TIME: 2.00 PM - 5.00 PM**

INSTRUCTION TO CANDIDATES

- SEE INSIDE

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STA 217: PRINCIPLES OF STATISTICAL INFERENCE

STREAM: ASC **DURATION: 3 Hours**

INSTRUCTION TO CANDIDATES

Answer **ALL** questions from section A and any **THREE** from section B.

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QUESTION ONE (15mks)

a) Distinguish between type I and type II error (2mks)

b) Give two methods of inferential statistics (2mks)

c) Given X is a binomial random variable with parameters n and p. Show that the sample proportion $\hat{p}$ is an unbiased estimator of p. (2mks)

d) Find the standard error of the sample mean. (3mks)

e) Let $x_1, x_2, \ldots, x_n$ be a random sample from a gamma distribution with parameters α and β having $E(x) = \alpha\beta$ and $var(x) = \alpha\beta^2$

i) Obtain the moment estimators of α and β. (3mks)

ii) The data below shows the survival time in weeks of male mouse exposed to gamma radiation. Assuming that it has gamma distribution, compute the value of α and β

152,115,109,94,88,137,152,79,100,160,165,125,40,128,123,136,101,62,153,83, (3mks)

QUESTION TWO (16mks)

a) i) Distinguish between a null hypothesis and an alternative hypothesis. (2mks)

ii) Give the steps in conducting a hypothesis testing. (2mks)

b) State and explain two methods of estimation (2mks)

c) The quality department of a wire manufacturing company periodically select a sample of wire specimens in order to test for breaking strength. Past experience has shown that the breaking strength of a certain type of wire are normally distributed with standard deviation

of 200kg. A random sample of 64 specimens gave a mean of 6200kg. Find out the population mean at 95% level of confidence. (6mks)

d) In a sample of 800 candidates, 560 were male. Estimate the population proportion at 95% confidence level. (4mks)

SECTION B (39 MARKS).

QUESTION THREE (13 MARKS).

a) Recent information suggests that obesity is an increasing problem among all age groups. It was reported in 2014 that 1276 individuals in a sample of 4115 adults were found to be obese. The 2009 census reveal that 30% of Kenyan adults were found to be obese. Does the recent data suggest that the true proportion of obese is different from the census one 5% level of significance? (4mks)

b) A study was carried out to evaluate the efficacy of the polio vaccine in combating polio. The vaccine was administered to one group and a placebo to a controlled group. The results are indicated below

Vaccine: m = 200,745, x = number of polio cases = 33

Placebo: n = 201,229, y = number of polio cases = 110

Test the hypothesis that a vaccinated child is less likely to contact polio than unvaccinated child at 1% level of significance. (4mks)

c) A random sample of 18 newborns in a rural health institution gave the following results

Boys	3.7	2.7	2.6	4.1	3.7	3.3	3.3	4.2	2.8	2.6
Girls	3.2	2.3	3.3	2.6	3.3	3.4	3.1	3.6		

Test at $\alpha = 0.05$ the hypothesis that the mean birth weight of boys is greater than that of girls in the health institution. (5mks)

QUESTION FOUR (13 MARKS).

a) Explain what you understand by the term correction factor? (1mk)

b) According to R.A Fisher, state and explain for criteria for a good estimator (4mks)

c) A sample of 600 accounts was taken to test the accuracy of posting and balancing of accounts where in 45 mistakes were found. Find out the population proportion. Use 99% level of confidence. (4mks)

d) A manager wants to estimate of sales in his company. A random sample 100 out of 500 salesmen is selected and average sales are found to be sh75,000. If a sample standard deviation is sh 15,000, then find out the population mean at 99% level of confidence (4mks)

QUESTION FIVE (13 MARKS).

a) Differentiate between regression analysis and correlation analysis. (3mks)

b) Four groups of students were subjected to different teaching techniques and tested at the end of the semester. The marks obtained are given below

TEACHING METHOD			
I	II	III	IV
65	75	59	94
87	69	78	89
73	83	67	80
79	81	62	88
81	72	83	
69	79	76	
	90		

Perform the Kruskal Wallis test and give the necessary conclusion (10mks)

QUESTION SIX (13 MARKS).

a) An administrator tries out a new crime prevention strategy in an area. The following data represents crimes rate for one year before and after the implementation of the strategy. Perform the Wilcoxon signed rank test. (8mks)

Month	1	2	3	4	5	6	7	8	9	10	11	12
Before	8.2	9.8	10.2	10.5	14.2	12.4	11.8	15.5	6.1	11.9	8.6	17.6
After	8.5	7.8	11.2	1.1	7.5	3.9	8.2	3.1	10.3	10.2	4.5	11.3

b) The following contingency table represents the incidents of three types of malaria in three tropical regions. Test the hypothesis of independence between the type of malaria and the tropical region. (5mks)

Type of Malaria	TROPICAL REGION		
	Asia	Africa	South America
A	31	14	45
B	2	5	53
C	53	45	2

QUESTION SEVEN (13 MARKS).

a) State two methods of point estimation (2mks)

b) A cigarette manufacturer wishes to use a random sample to estimate the average nicotine content. The sampling error should not be more than one milligram above or below the true mean, with a 99% confidence coefficient. The population standard deviation is 4 milligrams. What sample size should the company use in order to satisfy these requirements? (3mks)

c) A firm wishes to estimate with a maximum allowable error of 0.05 and a 95% level of confidence, the proportion of consumers who prefer its product. How large a sample will be required in order to make such an estimate if preliminary sales report indicates that 25% of all consumers prefer the firm's products? (4mks)

d) An algebra placement test was used to determine placement in mathematics course. A sample of 50 students gave the following scores. Calculate the 95% confidence interval of the population mean μ

29,21,28,24,22,24,22,23,15,21,22,17,15,23,17,18,23,18,17,14,19,16,22,23,14,19,19,
22,16,21,12,28,20,17,24,12,18,18,10,21,22,26,24,14,27,15,24,28,13. (4mks)

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